MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2016/2017

PMT0201 – MATHEMATICS II

(All sections / Groups)

17 OCTOBER 2016
9.00 a.m – 11.00 a.m
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of FOUR pages with FIVE questions.
2. Attempt **ALL FIVE** questions. All questions carry equal marks and the distribution of the marks for each question is given.
3. Show proper steps and write all your answers in the answer booklet provided.

QUESTION 1 (10 Marks)

(a) Suppose that the terminal point determined by t is the point $P\left(x, \frac{\sqrt{3}}{2}\right)$ on the unit circle in Quadrant I.

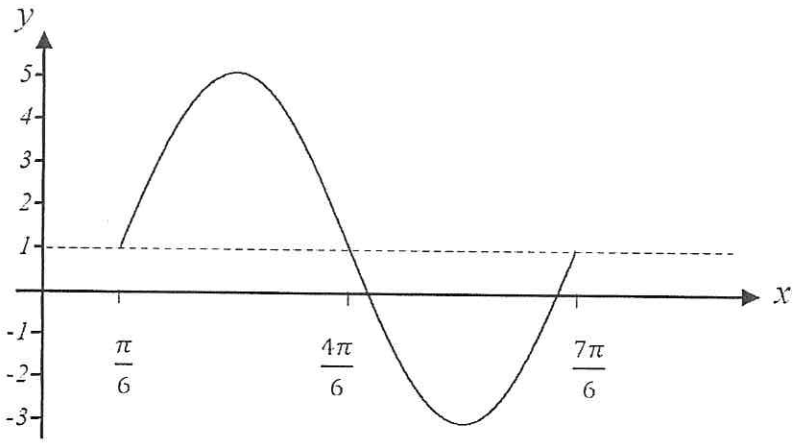
(i) Find its x-coordinate.

(ii) Find the terminal point determined by $t+\pi$. Explain your answer.

[3 marks]

(b) If $\cos t = -\frac{\sqrt{8}}{3}$ and the terminal point of t is in Quadrant III, find the exact values of all trigonometric functions at t. **[4 marks]**

(c) The graph of one complete period of a sine curve is given below.



(i) Find the amplitude, horizontal shift, vertical shift, and period of the sine curve.

(ii) Write an equation that represents the sine curve. **[3 marks]**

Continued ...

QUESTION 2 (10 Marks)

(a) Find the exact value of $\cos\left(\sin^{-1}\left(-\frac{3}{5}\right)\right)$. **[2 marks]**

(b) Given a triangle ABC with $\angle A = 110°$, $\angle B = 30°$ and $b = 3$.

(i) Sketch the triangle with the given information and find $\angle C$.

(ii) Use the Law of Sines to find a and c. Round your answer to TWO decimal places. **[3 marks]**

(c) Consider the equation $\sin(2\theta) - \frac{1}{2} = 0$.

(i) Find the general solutions of the equation.

(ii) Use your answer in (i) to find the solutions in the interval $0 \le \theta < \pi$. **[3 marks]**

(d) Show that $\frac{\tan x + \cot x}{\sec x \csc x} = 1$. **[2 marks]**

QUESTION 3 (10 Marks)

(a) Given the complex number $z = -\sqrt{3} + i$.

(i) Plot the point z on the complex number plane.

(ii) Determine the modulus r and argument θ of z, then write down the polar form of z.

(iii) Use De Moivre's Theorem to find z^3.
Leave your answer in the standard form $a + bi$. **[3 marks]**

(b) Find the limits

(i) $\lim_{x \to 0} \frac{(1-x)^2 - 1}{x}$

(ii) $\lim_{x \to 5} \frac{x^2 + x - 30}{x - 5}$

(iii) $\lim_{x \to \infty} \frac{4x^3 + x + 1}{2 - x^3}$ **[3 marks]**

(c) Let $f(x) = \begin{cases} 3x + 2 & x < 4 \\ 10 & x = 4 \\ x^2 - 2 & x > 4 \end{cases}$

(i) Find $f(4)$, $\lim_{x \to 4^-} f(x)$, $\lim_{x \to 4^+} f(x)$ and $\lim_{x \to 4} f(x)$.

(ii) Determine whether $f(x)$ is continuous at $x = 4$. Give the reason for your answer. **[4 marks]**

Continued ...

QUESTION 4 (10 Marks)

(a) The derivative of $f(x)$ with respect to x is the function $f'(x)$ and is defined as

$$f'(x)=\lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$$

Use the above definition to find $f'(x)$ if $f(x)=x^2-1$. **[2 marks]**

(b) Use product rule or quotient rule to find $f'(x)$. Then evaluate $f'(0)$.

(i) $f(x)=(2x^2+3x)\sin x$

(ii) $f(x)=e^{-x}(x-4)$ **[3 marks]**

(c) Use the chain rule to find the derivative of $f(x)=(1+2x^{-1}+x^{-2})^5$. Show proper steps. **[3 marks]**

(d) The displacement of a particle on a vibrating string is given by the equation $s(t)=10+\frac{1}{4}\sin(10\pi t)$ where s is measured in centimeters and t in seconds. Find the displacement and velocity of the particle after $t=2$ seconds. **[2 marks]**

QUESTION 5 (10 Marks)

(a) Use technique of substitution to find $\int(x-3)\left(\frac{1}{2}x^2-3x\right)^5 dx$. **[3 marks]**

(b) Use integration by parts to find $\int 5x\,e^x dx$. **[3 marks]**

(c) Sketch the region corresponding to each definite integral. Then evaluate each integral.

(i) $\int_{-1}^{1} x^2\,dx$

(ii) $\int_{1}^{3}(x+5)\,dx$ **[4 marks]**

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